

CLAIMS

Sub
2 A 1. A method of establishing a communication link between a
4 communication device and a smart card adapted to communicate using a
6 valid smart card communication protocol, wherein the valid smart card
8 communication protocol is one of a plurality of smart card communication
10 protocols, the method comprising the steps of:
12 transmitting a plurality of initiation messages, wherein each of
plurality of initiation messages corresponds to each of the plurality of smart
card protocols;
receiving an acknowledgment message in accordance with the
valid smart card communication protocol from the smart card; and
establishing the communication link using the valid smart card
communication protocol.

2. A method in accordance with claim 1 wherein the step of
transmitting comprises the step of transmitting the plurality of initiation
messages through a single communication channel.

3. A method in accordance with claim 2 wherein the step of receiving
comprises the step of receiving the acknowledgment message through the
single communication channel.

Sub
2 A 4. A method in accordance with claim 1 wherein the step of
4 transmitting comprises the steps of:
6 transmitting a first initiation message in accordance with a first
8 smart card protocol;
10 monitoring, for a first predetermined time, the communication
12 channel for a first acknowledgment message in accordance with the first
smart card communication protocol;
transmitting a second initiation message in accordance with a
second smart card communication protocol;
monitoring, for a second predetermined time, the
communication channel for a second acknowledgment message in
accordance with the second smart card communication protocol; and

repeating the steps of transmitting the first initiation message,
14 monitoring the channel for the first acknowledgment message, transmitting
the second initiation message and monitoring the communication channel for
16 the second acknowledgment message until the acknowledgment message in
accordance with the valid smart card communication protocol is received.

5. A method in accordance with claim 1 wherein the step of
2 establishing the communication link comprises the steps of:
establishing a communication link between a master module and the
4 smart card using the smart card communication protocol; and
establishing a second data communication link between the master
6 module and the central computer system.

6. A method in accordance with claim 5 wherein the step of
2 establishing the communication link between the master module and the
smart card comprises the steps of:
4 configuring transceiver hardware in accordance with the valid
smart card communication protocol to acquire an incoming signal in
6 accordance with the valid smart card communication protocol; and
demodulating the incoming signal in accordance with valid smart
8 card communication protocol.

7. A method of establishing a communication link between a central
2 computer system and a smart card, the communication link using a valid
smart card communication protocol of a plurality of smart card communication
4 protocols, the method comprising the steps of:
polling a communication channel using a plurality of smart card
6 communication protocols;
identifying the valid smart card communication protocol when a
8 valid acknowledgment message is received through the communication
channel; and
10 establishing the communication link between the smart card and
the central computer system through the communication channel using the
12 valid smart card communication protocol.

- 34 -

2 8. A method of establishing a communication link in accordance with
4 claim 7 wherein the step of polling the communication channel comprises:
6 receiving a poll message from a central computer system, the
8 message identifying the plurality of smart card communication protocols;
10 instructing a digital signal processor to generate an initiation message
12 in accordance with a smart card communication protocol of the plurality of
14 smart card communication protocols;
16 configuring transceiver hardware in accordance with the smart card
18 communication protocol;
transmitting the initiation message through the communication
channel;
waiting a predetermined wait period associated with the smart card
communication protocol unless the valid acknowledgment message is
received; and
repeating, for another smart card communication protocol of the
plurality of smart card communication protocols, the steps of instructing,
configuring the transceiver hardware, transmitting the initiation message, and
waiting.

Sub 23
9. A method in accordance with claim 8 further comprising the steps of:
shifting an incoming radio frequency signal to a desired
frequency bandwidth to produce a shifted signal;
4 converting the shifted signal to a digital signal; and
6 demodulating the digital signal in accordance with the smart
card communication protocol.

2 10. A method in accordance with claim 9 wherein the step of shifting
an incoming radio frequency signal comprises the step of shifting the
incoming radio frequency signal to a baseband frequency bandwidth.

2 11. A method in accordance with claim 9 further wherein the step of
shifting the incoming radio frequency signal comprises the step of shifting the
incoming radio frequency to a subcarrier frequency bandwidth.

- 35 -

12. A method of establishing a communication link between a
 2 communication device and a smart card adapted to communicate using valid
 smart card communication protocol, wherein the valid smart card
 4 communication protocol is one of a plurality of smart card communication
 protocols, the method comprising the steps of:
 6 sequentially transmitting a plurality of initiation messages,
 wherein each of plurality of initiation messages corresponds to each of the
 8 plurality of smart card protocols;
 monitoring a communication channel for an acknowledgment
 10 message corresponding to one of the plurality of smart card protocols until an
 acknowledgment message in accordance with the valid smart card
 12 communication protocol is received; and
 establishing the communication link using the valid smart card
 14 communication protocols.

¹²₁₃ A smart card communication device for establishing a
 2 communication link between a smart card and a computer, the smart card
 communication device comprising:
 4 a transceiver having a variable structure responsive to a control
 signal;
 6 a digital signal processor coupled to the transceiver;
 a controller coupled to the digital signal processor and the
 8 transceiver, the controller adapted to generate the control signal based on a
 plurality of smart card communication protocols.

¹³₁₄ A smart card communication device in accordance with claim ¹²₁₃
 2 wherein the controller is further adapted to instruct the digital signal processor
 to demodulate an incoming signal received by the transceiver in accordance
 4 with the plurality of smart card communication protocols.

¹⁴₁₅ A smart card communication device in accordance with claim ¹³₁₄
 2 wherein the transceiver comprises:
 a radio frequency transmitter adapted to generate an
 4 electromagnetic field; and
 a radio frequency receiver adapted to detect variations in the
 6 electromagnetic field.

- ¹⁵
16. A smart card communication device in accordance with claim ¹⁴~~15~~
2 wherein the radio frequency receiver comprises:
a first configuration based on the control signal and adapted to
4 shift a data signal modulated onto an incoming radio frequency signal to a
first desired frequency bandwidth; and
6 a second configuration based on the control signal and adapted
to shift the data signal to a second desired frequency bandwidth.

- Sub
A4
17. A smart card communication device in accordance with claim 16,
2 wherein the digital signal processor comprises:
a first demodulator adapted to demodulate the data signal
4 produced by the receiver in accordance with a first smart card communication
protocol of the plurality of smart card communication protocols;
6 a second demodulator adapted to demodulate the data signal in
accordance with a second smart card communication protocol of the plurality
8 of smart card communication protocols.

18. A smart card communication device in accordance with claim 17,
2 wherein:
the first desired frequency bandwidth is a baseband frequency
4 bandwidth;
and the second desired frequency bandwidth is a subcarrier
6 frequency bandwidth.

- ¹⁸
¹⁹19. A smart card communication device in accordance with claim ¹²~~13~~,
2 wherein the controller is further adapted to receive a plurality of commands
from a master module for instructing the controller to poll for one or more
4 smart cards, wherein each smart card corresponds to one of the plurality of
smart card communication protocols.

- ¹⁹
²⁰20. A smart card communication device for communicating with a
2 smart card using a valid smart card communication protocol of a plurality of
smart card communication protocols, the device comprising:

- 37 -

4 a digital signal processor adapted to generate a plurality of
initiation messages wherein each of the initiation messages is in accordance
6 with each of the plurality of smart card communication protocols; and
a transceiver coupled to the digital signal processor and
8 adapted to transmit the plurality of initiation messages in accordance with a
modulation type corresponding to an initiation message of the plurality of
10 initiation messages corresponding to a first smart card communication
protocol of the plurality of smart card communication protocols.

20
15
10
5

21. A digital signal processor comprising:
2 a first demodulator adapted to demodulate a first incoming data
signal in accordance with a first smart card communication protocol; and
4 a second demodulator adapted to demodulate a second
incoming data signal in accordance with a second smart card communication
6 protocol.

22. A digital signal processor in accordance with claim 21 further
2 comprising a third demodulator adapted to demodulate a third incoming data
signal in accordance with a third smart card communication protocol.

23. A digital signal processor in accordance with claim 22 wherein:
2 the first demodulator is a split phase demodulator adapted to
demodulate the first incoming data signal modulated using amplitude shift
4 keying modulation for contactless smart cards; and
the second demodulator is a Costas loop demodulator adapted to
6 demodulate the second incoming data signal modulated using amplitude shift
keying modulation for contactless smart cards.

24. A radio frequency circuit adapted for establishing a communication
2 link with a smart card using any one of a plurality of smart card
communication protocols, the radio frequency circuit comprising:
4 a first configuration based on a control signal and adapted to
acquire a data signal modulated onto an incoming radio frequency signal in
6 accordance with a first smart card communication protocol of the plurality of
smart card communication protocols; and

8 a second configuration based on the control signal and adapted
to acquire a data signal modulated on to the incoming radio frequency signal
10 in accordance with a second smart card communication protocol of the
plurality of smart card communication protocols.

22
25. A radio frequency circuit in accordance with claim 21, wherein the
2 first configuration comprises a mixer adapted to shift the data signal to a
baseband frequency band.

23
26. A radio frequency circuit in accordance with claim 22, wherein the
2 second configuration comprises a filter coupled to an output of the mixer, the
filter having a frequency response minimizing signals outside a subcarrier
4 bandwidth.

24
27. A radio frequency circuit in accordance with claim 23, further
2 comprising:
a analog to digital converter; and
4 a switch adapted to couple the output of the mixer to the analog
to digital converter in a first mode and adapted to couple an output of the filter
6 to the analog to digital converter in a second mode.

600750 9226260
28. A radio frequency circuit adapted for use in a smart card
2 communication device, the radio frequency circuit comprising:
a first mixer adapted to shift an incoming radio frequency signal
4 to a baseband frequency to produce a baseband signal;
a second mixer shifting the baseband signal to a subcarrier
6 frequency; and
a switch having a first input port coupled to the first mixer, a
8 second input port coupled to an output of the second mixer, and an output
port, the switch adapted to couple the first input port to the output port in a
10 first mode and the second port to the output port in a second mode.

26
29. A radio frequency circuit in accordance with claim 25 further
2 comprising an analog to digital converter coupled to the output port of the
switch.

cu
on
a
con

communicating with a
incoming radio
card commun
coming data s
the incoming da

~~SWP~~
~~AS~~

with claim 3
communication
radio frequen
bit data stre

[illegible]

6 modulating an outgoing bit data stream transmitted from the master module to produce an outgoing radio frequency signal.

2 34. A method in accordance with claim 33 wherein the step of establishing radio frequency communication channel further comprises the steps of:

4 arranging the incoming bit data stream into a plurality of incoming data packets; and

6 appending a header to at least one of the plurality of incoming
7 data packets, the header including information indicating a security device
8 type.

35. A method in accordance with claim 34 wherein the step of
2 establishing the secure communication channel comprises the steps of:

4 removing the header from the at least one packet to produce the incoming data at the master module; and

6 routing the incoming data to the security device based on the information included in the header, wherein the security device is one of a plurality of security devices within the master module.

36. A method of remotely re-programming a smart card communication device comprising the steps of:

transmitting new code through a data channel from central
4 computer system through a master module coupled to a network;
storing the new code in a memory device; and
6 loading the new code form the memory device to a processor.

37. A method in accordance with claim 36, wherein the new code
2 facilitates the demodulation of a signals transmitted in accordance with a
smart card communication protocol.

38. A method in accordance with claim 36, wherein the memory device
2 is an electrically erasable programmable read only memory device.

2 39. A method in accordance with claim 36, wherein the memory device is a ferro-electric random access memory device.